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US ARMY DEFENSE AMMUNITION CENTER
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SJMAC-DEV (70-1pp) 6 February 2007

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SUBJECT: Report No. 06-04A2, "Transportability Testing of the Joint Modular Intermodal Platform (JMIP)", TP-94-01, "Transportability Testing Procedures"

1. Enclosed please find subject report dated November 2006.

2. The POC is the undersigned, SJMAC-DEV, DSN 956-8908.

FOR THE DIRECTOR:

for JERRY W. BEAVER
Chief, Validation Engineering Division

Encl
as

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**FINAL REPORT**
**NOVEMBER 2006**

**REPORT NO. 06-04A2**

# TRANSPORTABILITY TESTING OF THE JOINT MODULAR INTERMODAL PLATFORM (JMIP) TP-94-01, "TRANSPORTABILITY TESTING PROCEDURES"

Prepared for:

TACOM/ ARDEC
Logistics Research and Development Activity
ATTN: AMSRD-AAR-AIL-F
Picatinny Arsenal, NJ 07806

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**REPORT NO. 06-04A2** **NOVEMBER 2006**
**TRANSPORTABILITY TESTING OF THE**
**JOINT MODULAR INTERMODAL PLATFORM (JMIP)**
**TP-94-01, REV. 2, JUNE 2004, "TRANSPORTABILITY TESTING PROCEDURES"**

## ABSTRACT

The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SJMAC-DEV), was tasked by the Logistics Research and Development Activity (AMSRD-AAR-AIL-F), Picatinny Arsenal, NJ to conduct transportability retesting on the Joint Modular Intermodal Platform (JMIP) manufactured by SEA BOX Inc, East Riverton, NJ. The testing was conducted in accordance with TP-94-01, Revision 2, June 2004 "Transportability Testing Procedures."

The major change on the JMIP from the unit previously tested (Report 06-04A1) was that the material of the pins that hold the cams in position was changed to a harder strength material.

The objective of the testing was to evaluate the Joint Modular Intermodal Platform (JMIP) when transportability tested in accordance with TP-94-01, Revision 2, June 2004 for use during the Limited Military Utility Assessment (LMUA). The retest was to determine if the JMIP could be transported on/off road in an intermodal container. Previously the JMIP had successfully completed the on/off road testing with a PLS truck (Report 06-04A1).

The following observations resulted from the testing of JMIP:

1. Some movement of the adjustment bolt on the cams did occur during the testing. The movement of the cam locking bolt was not significant enough to cause excessive movement of JMIP. Future designs of the cam locking devices should prevent the bolts from moving in or out.

2. The bail bar of the A-frame rested against the container door when in the container transport position.

3. During the washboard course testing, the bolts holding the A-frame in the container transport position failed and the testing was discontinued.

The JMIP, as currently designed, is **not adequate** for the transportation of ammunition in an intermodal container.

Prepared by:

PHILIP W. BARICKMAN
Lead Validation Engineer

Reviewed by:

JERRY W. BEAVER
Chief, Validation Engineering Division

**U.S. ARMY DEFENSE AMMUNITION CENTER**

VALIDATION ENGINEERING DIVISION
MCALESTER, OK 74501-9053

**REPORT NO. 06-04A2**

**Transportability Testing of the Joint Modular Intermodal Platform (JMIP)**
**TP-94-01, Revision 2, June 2004 "Transportability Testing Procedures"**

TABLE OF CONTENTS

## PART 1 – INTRODUCTION

**A. BACKGROUND**. The U.S. Army Defense Ammunition Center (DAC), Validation Engineering Division (SJMAC-DEV), was tasked by the Logistics Research and Development Activity (AMSRD-AAR-AIL-F), Picatinny Arsenal, NJ to conduct transportability retesting on the Joint Modular Intermodal Platform (JMIP) manufactured by SEA BOX Inc, East Riverton, NJ. The testing was conducted in accordance with TP-94-01, Revision 2, June 2004 "Transportability Testing Procedures."

The major change on the JMIP from the unit previously tested (Report 06-04A1) was that the material of the pins that hold the cams in position was changed to a harder strength material.

**B. AUTHORITY**. This test was conducted IAW mission responsibilities delegated by the U.S. Army Joint Munitions Command (JMC), Rock Island, IL. Reference is made to the following:

1. AR 740-1, 15 June 2001, Storage and Supply Activity Operation.

2. OSC-R, 10-23, Mission and Major Functions of U.S. Army Defense Ammunition Center (DAC) 21 Nov 2000.

**C. OBJECTIVE**. The objective of the testing was to evaluate the Joint Modular Intermodal Platform (JMIP) when transportability tested in accordance with TP-94-01, Revision 2, June 2004 for use during the Limited Military Utility Assessment (LMUA). The retest was to determine if the JMIP could be transported on/off road in an intermodal container. Previously the JMIP had successfully completed the on/off road testing with a PLS truck (Report 06-04A1).

**D. OBSERVATIONS**.

1. Some movement of the adjustment bolt on the cams did occur during the testing. The movement of the cam locking bolt was not significant enough to cause excessive movement of JMIP. Future designs of the cam locking devices should prevent the bolts from moving in or out.

2. The bail bar of the A-frame rested against the container door when in the container transport position.

3. During washboard course testing the bolts holding the A-frame in the container transport position failed and the testing was discontinued.

**E. CONCLUSION**. The JMIP, as currently designed, is **not adequate**, for the transportation of ammunition in an intermodal container.

## PART 2 - ATTENDEES

| ATTENDEE | MAILING ADDRESS |
|---|---|
| Philip Barickman<br>DSN 956-8992<br>(918) 420-8992 | Director<br>U.S. Army Defense Ammunition Center<br>ATTN: SJMAC-DEV<br>1 C Tree Road, Bldg. 35<br>McAlester, OK 74501-9053 |
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## PART 3 - TEST EQUIPMENT

1. Joint Modular Intermodal Platform
   Manufactured by SEA BOX, East Riverton, NJ
   Model Number: J-MIP LN702
   Serial Number: 00002
   Date of Manufacture: 27 February 2006
   Tare Weight: 3,960 pounds

2. Joint Modular Intermodal Container
   Manufactured by British Aerospace Engineering
   Weight: 310 pounds
   Length: 51-3/4 inches
   Width: 43-3/4 inches
   Height: 43-1/4 inches

3. Joint Modular Intermodal Container
   Manufactured by Naval PHST Center - Earle, NJ
   Closed JMIC
   Weight: 325 pounds
   Length: 51-3/4 inches
   Width: 43-3/4 inches
   Height: 43 inches

4. Joint Modular Intermodal Container
   Manufactured by Naval PHST Center – Earle, NJ
   Open Framed JMIC
   Weight: 285 pounds
   Length: 51-3/4 inches
   Width: 43-3/4 inches
   Height: 43 inches

5. Palletized Load System Truck
   Model #: M1074
   Manufactured by Oshkosh Truck Corporation, Oshkosh, WI
   ID #: 10T2P1NH6N1044011
   NSN: 2320-01-304-2277
   Serial #: 44011
   Curb Weight: 55,000 pounds

6. Truck, Tractor, MTV, M1088 A1
   ID #: J0231
   NSN: 2320 01 447 3893
   VSN: NL1FR5
   MFG Serial #: T-018447EFJM
   Weight: 19,340 pounds

7. Semitrailer, flatbed, breakbulk/container transporter, 34 ton
   Model #: M872A1
   Manufactured by Heller Truck Body Corporation, Hillsdale, NJ
   ID #: 11-1505 NX05NZ
   NSN: 2330 01 109 8006
   Weight: 19,240 pounds

8. Intermodal Container
   ID # CMCU 200006-8
   Date of Manufacture: 06/99
   Manufactured by Charleston Marine Containers, Charleston, SC
   Tare Weight: 4,870 pounds
   Maximum Gross Weight: 67,200 pounds

## PART 4 - TEST PROCEDURES

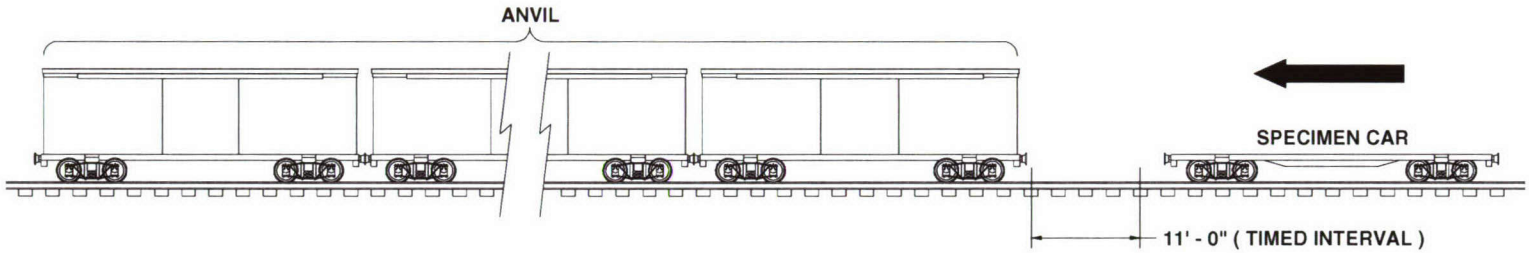
The test procedures outlined in this section were extracted from TP-94-01, "Transportability Testing Procedures," Revision 2, June 2004, for validating tactical vehicles and outloading procedures used for shipping munitions by tactical truck, railcar, and ocean-going vessel.

The rail impact will be conducted with the loaded intermodal container secured directly to the railcar. Inert (non-explosive) items were used to build the load. The test loads were prepared using the blocking and bracing procedures proposed for use with munitions (***see Part 6- Drawings for procedures***). The weight and physical characteristics (weights, physical dimensions, center of gravity, etc.) of the test loads were similar to live (explosive) ammunition.

**A. RAIL TEST. RAIL IMPACT TEST METHOD**. The test load or vehicle will be secured to a flatcar. The equipment needed to perform the test will include the specimen (hammer) car, four empty railroad cars connected together to serve as the anvil, and a railroad locomotive. The anvil cars will be positioned on a level section of track with air and hand brakes set and with draft gears compressed. The locomotive unit will push the specimen car toward the anvil at a predetermined speed, then disconnect from the specimen car approximately 50 yards away from the anvil cars allowing the specimen car to roll freely along the track until it strikes the anvil. This will constitute an impact. Impacting will be accomplished at speeds of 4, 6, and 8.1 mph in one direction and at a speed of 8.1 mph in the reverse direction. The tolerance for the speeds is plus 0.5 mph, minus 0.5 mph for the 4 mph and 6 mph impacts, and plus 0.5 mph, minus 0 mph for the 8.1 mph impacts. The impact speeds will be determined by using an electronic counter to measure the time for the specimen car to traverse an 11-foot distance immediately prior to contact with the anvil cars (see Figure 1).

# ASSOCIATION OF AMERICAN RAILROADS (AAR)

# STANDARD TEST PLAN




**4 BUFFER CARS (ANVIL)**
**WITH DRAFT GEAR**
**COMPRESSED AND AIR BRAKES IN A SET POSITION**

**ANVIL CAR TOTAL WT. 250,000 LBS (APPROX)**

**SPECIMEN CAR IS RELEASED BY SWITCH ENGINE TO**
**ATTAIN: IMPACT NO. 1 @ 4 MPH**
**IMPACT NO. 2 @ 6 MPH**
**IMPACT NO. 3 @ 8.1 MPH**

**THEN THE CAR IS REVERSED AND RELEASED BY SWITCH ENGINE TO ATTAIN:**

**IMPACT NO. 4 @ 8.1 MPH**

**Figure 1. Rail Impact Sketch**

## B. ON/OFF ROAD TEST.

**1. HAZARD COURSE**. The test load or vehicle will be transported over the 200-foot-long segment of concrete-paved road consisting of two series of railroad ties projecting 6 inches above the level of the road surface. The hazard course will be traversed two times (see Figure 2).

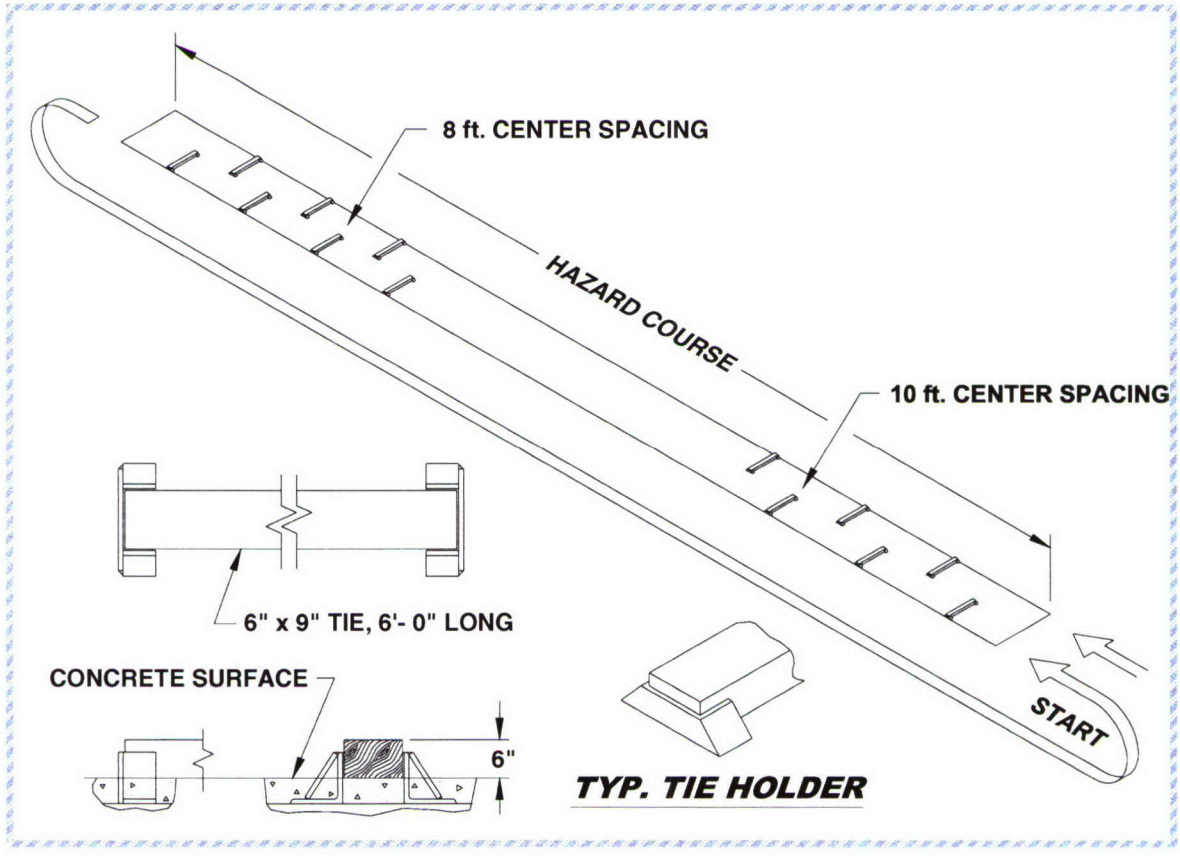



**Figure 2. Hazard Course Sketch**

a. The first series of 6 ties are spaced on 10-foot centers and alternately positioned on opposite sides of the road centerline for a distance of 50 feet.

b. Following the first series of ties, a paved roadway of 75 feet separates the first and second series of railroad ties.

c. The second series of 7 ties are spaced on 8-foot centers and alternately positioned on opposite sides of the road centerline for a distance of 48 feet.

d. The test load is driven across the hazard course at speeds that will produce the most violent vertical and side-to-side rolling reaction obtainable in traversing the hazard course (approximately 5 mph).

**2. ROAD TRIP**. The test load or vehicle will be transported for a distance of 30 miles over a combination of roads surfaced with gravel, concrete, and asphalt. The test route will include curves, corners, railroad crossings and stops and starts. The test load or vehicle will travel at the maximum speed for the particular road being traversed, except as limited by legal restrictions.

**3. PANIC STOPS**. During the road trip, the test load or vehicle will be subjected to three (3) full airbrake stops while traveling in the forward direction and one in the reverse direction while traveling down a 7 percent grade. The first three stops are at 5, 10, and 15 mph while the stop in the reverse direction is approximately 5 mph. This testing will not be required if the Rail Impact Test is performed.

**4. WASHBOARD COURSE**. The test load or vehicle will be driven over the washboard course at a speed that produces the most violent response in the vertical direction.

**C. OCEAN-GOING VESSEL TEST. Shipboard Transportation Simulator (Test Method 5).** The Shipboard Transportation Simulator (STS) is used for testing loads in 8-foot-wide by 20-foot-long intermodal freight containers. The specimen shall be positioned onto the STS and securely locked in place using the cam lock at each corner. Using the procedure detailed in the operating instructions, the STS shall begin oscillating at an angle of 30 degrees, plus or minus 2 degrees, either side of vertical center and a frequency of 2 cycles-per-

minute (30 seconds, plus or minus 2 seconds) for a duration of two (2) hours. This frequency shall be observed for apparent defects that could cause a safety hazard. The frequency of oscillation shall then be increased to 4 cycles-per-minute (15 seconds, plus or minus one second per cycle) and the apparatus operated for two (2) hours. If an inspection of the load does not indicate an impending failure, the frequency of oscillation shall be further increased to 5 cycles-per-minute (12 seconds, plus or minus one second per cycle), and the apparatus operated for four (4) hours. The operation does not necessarily have to be continuous; however, no changes or adjustments to the load or load restraints shall be permitted at any time during the test. After once being set in place, the test load (specimen) shall not be removed from the apparatus until the test has been completed or is terminated.

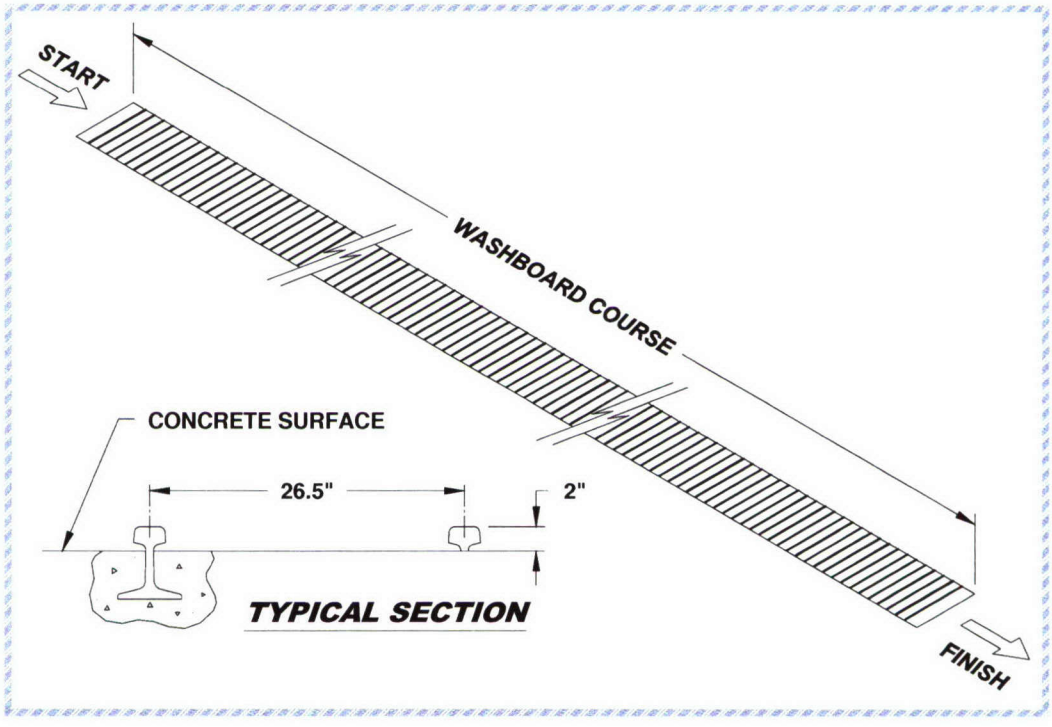



**Figure 3. Washboard Course Sketch**

# PART 5 - TEST RESULTS

**5.1**

Test Specimen: SEA BOX JMIP in an Intermodal Container.

Payload: 4 BAE JMICs and 2 Navy JMICs.

Testing Date: 12 September 2006

Gross Weight: 20,670 pounds (Including JMIP, interface frames, JMICs and intermodal container).

Note:

The bail bar of the A-frame rested against the container door when in the intermodal transport position.

## A. ON/OFF ROAD TESTS.

### 1. HAZARD COURSE.

**Photo 1. Hazard Course Testing of the JMIP in the Intermodal Container.**

| Pass No. | Elapsed Time | Avg. Velocity (mph) |
|---|---|---|
| 1 | 24 Seconds | 6 |
| 2 | 22 Seconds | 7 |

**Figure 4.**

**Remarks:**

1. Figure 4 lists the average speeds of the test load through the Hazard Course.
2. The adjustment bolts on the cams moved during Passes 1 & 2. The JMIP remained secure in the container. The pin that prevents the cam from rotating does not rest against the cam which may allow the cams and adjustment bolts to move.

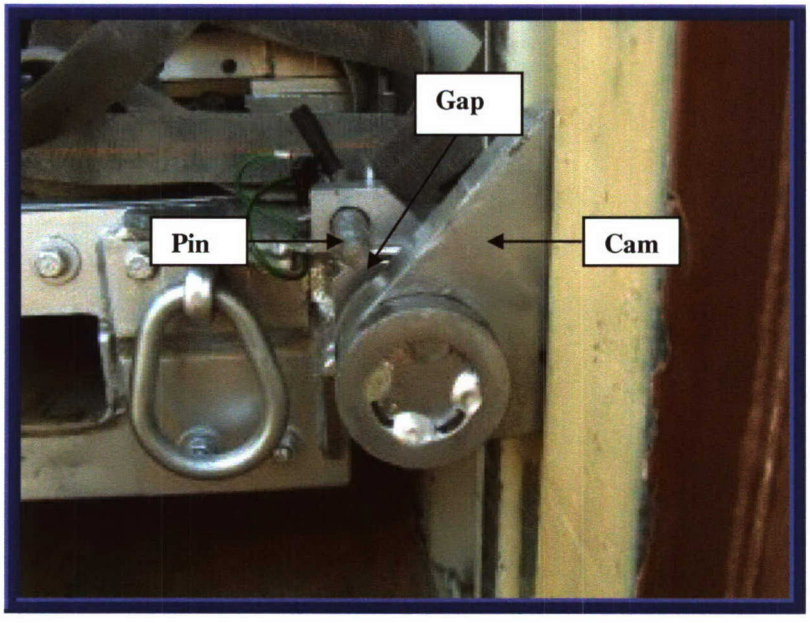



**Photo 2. Pin Distance from the Cam.**

## 2. ROAD TRIP:

**Remarks:**

1. The Road Trip was conducted between the Road Hazard Course Passes #2 and #3.
2. Inspection following the Road Trip revealed no damage or movement of the JMIP.

3. **PANIC STOPS:** Inspection following the completion of the reverse 5 MPH panic stop revealed that the JMIP slid toward the door of the container 0.25 inches. Due to the contact of the bail bar, the container door was difficult to close.

4. **HAZARD COURSE:**

| Pass No. | Elapsed Time | Avg. Velocity (mph) |
|---|---|---|
| 3 | 24 Seconds | 6 |
| 4 | 24 Seconds | 6 |

**Figure 5.**

**Remarks:**

1. Figure 5 lists the average speeds of the test load through the Hazard Course.
2. The adjustment bolts on the cams moved during Passes 3 & 4. The JMIP remained secure in the container.

5. **WASHBOARD COURSE:**

**Remark:**

Inspection following the Washboard Course revealed that one of the bolts that held the A-frame in the container transport position failed.

**Photo 3. Washboard Course Testing JMIP.**

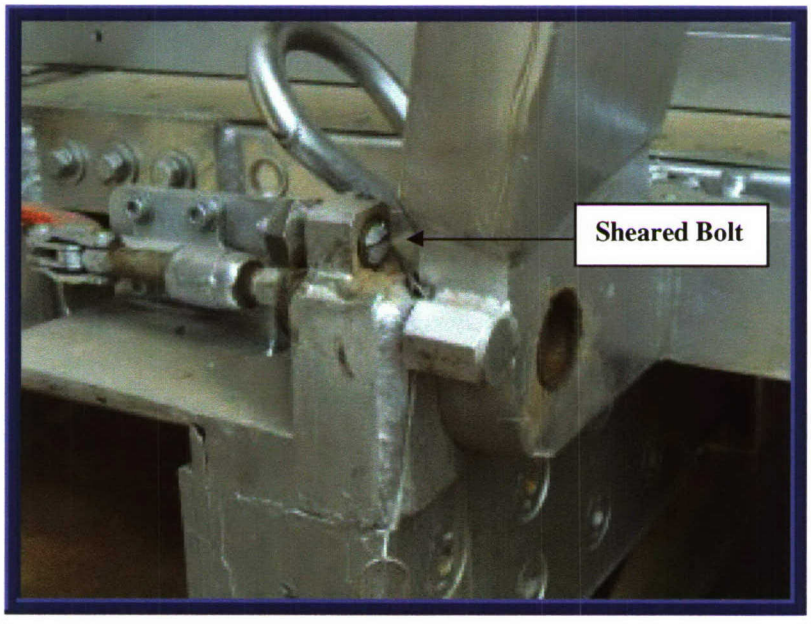



**Photo 4. Damaged Bolt.**

## B. OBSERVATIONS.

1. Some movement of the adjustment bolt on the cams did occur during the testing. The movement of the cam locking bolt was not significant enough to

cause excessive movement of JMIP. Future designs of the cam locking devices should prevent the bolts from moving in or out.

2. The bail bar of the A-frame rested against the container door when in the container transport position.

3. During the washboard course testing the bolts holding the A-frame in the container transport position failed and testing was discontinued.

**C. CONCLUSION.** The JMIP, as currently designed, is **not adequate**, for the transportation of ammunition in an intermodal container.

## PART 6 – DRAWINGS

The following drawing represents the load configuration that was subjected to the test criteria.

# TEST SKETCH

# LOADING AND BRACING OF JOINT MODULAR INTERMODAL CONTAINERS (JMICS) ON THE JOINT MODULAR INTERMODAL PLATFORM (JMIP)

---

## THIS TEN PAGE DOCUMENT DEPICTS NAVY AND BAE JMIC PROTOTYPES ON A SEABOX PROTOTYPE JMIP FOR INTEGRATION TRANSPORTABILITY TESTING AT AN APPROXIMATE 15,000 LBS GROSS LOAD

PREPARED DURING JULY 2006 BY:
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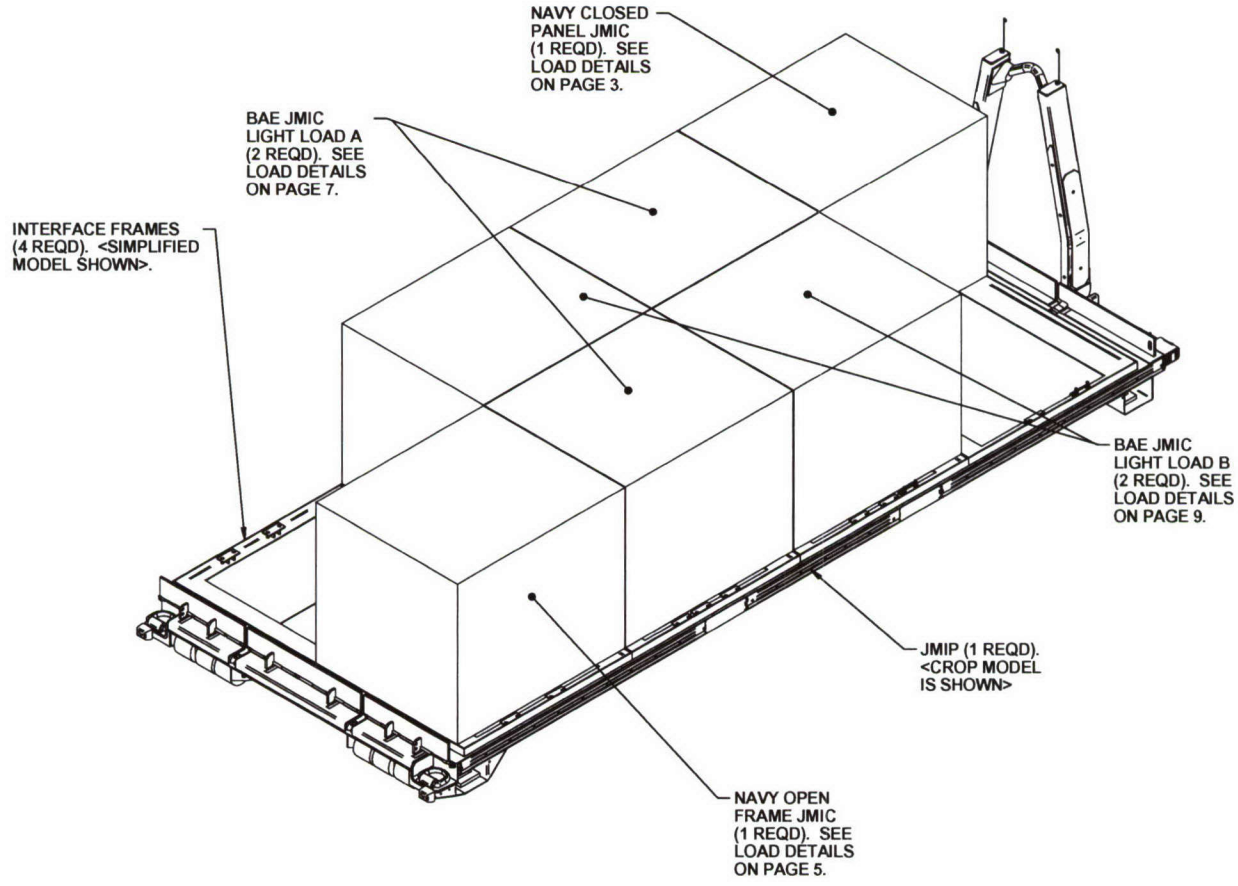


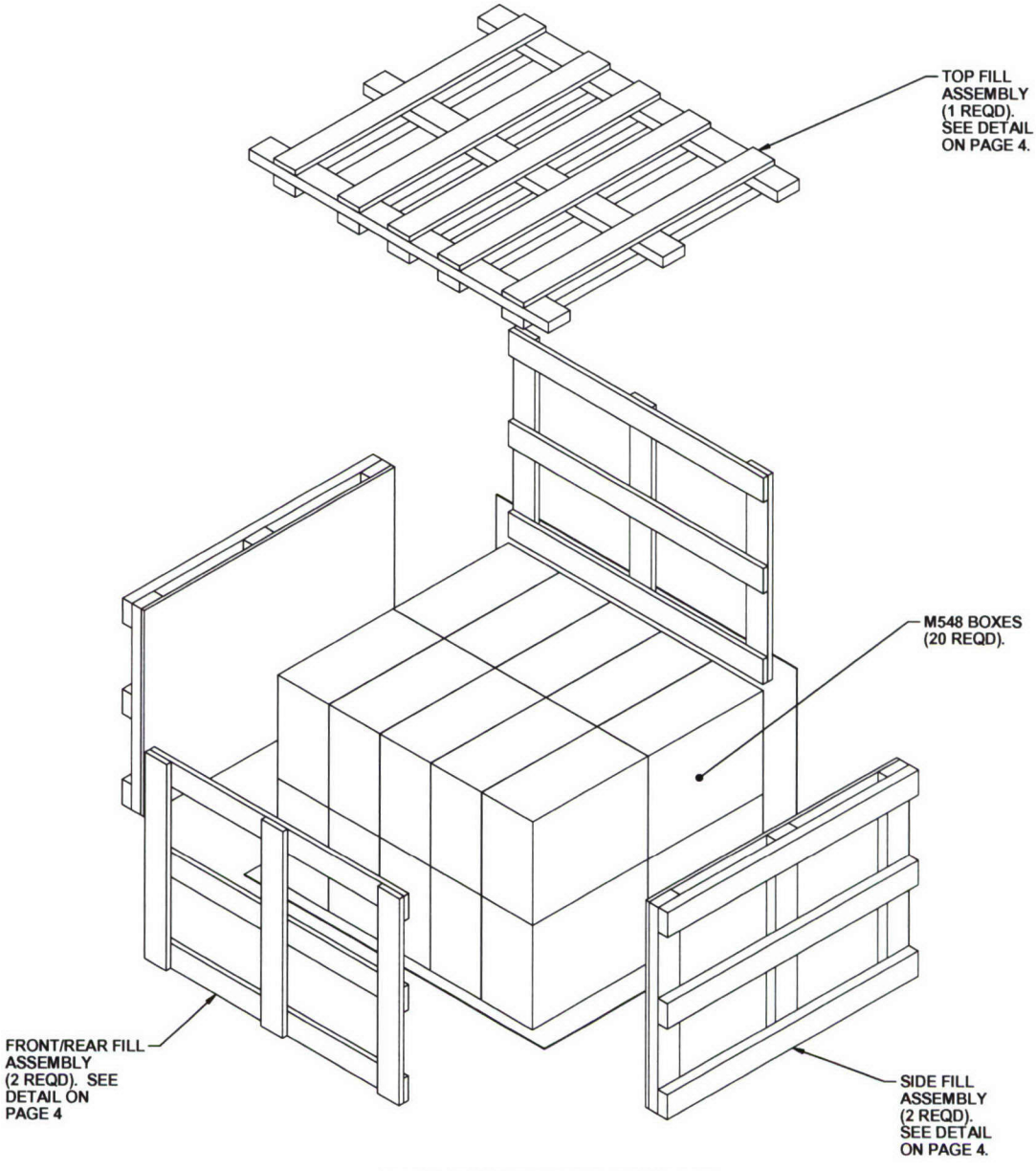

**ISOMETRIC VIEW**

**LOAD AS SHOWN**

| ITEM | QUANTITY | WEIGHT (APPROX) |
|---|---|---|
| NAVY PANEL JMIC | 1 | 2,971 LBS |
| NAVY FRAME JMIC | 1 | 2,916 LBS |
| BAE JMIC (4 BOXES) | 2 | 1,832 LBS |
| BAE JMIC (8 BOXES) | 2 | 2,792 LBS |
| INTERFACE FRAMES | 4 | 580 LBS |
| JMIP | | 3,800 LBS |
| TOTAL WEIGHT | | 14,891 LBS (APPROX) |



6 JMIC UNIT LOAD ON JOINT MODULAR INTERMODAL PLATFORM (JMIP)

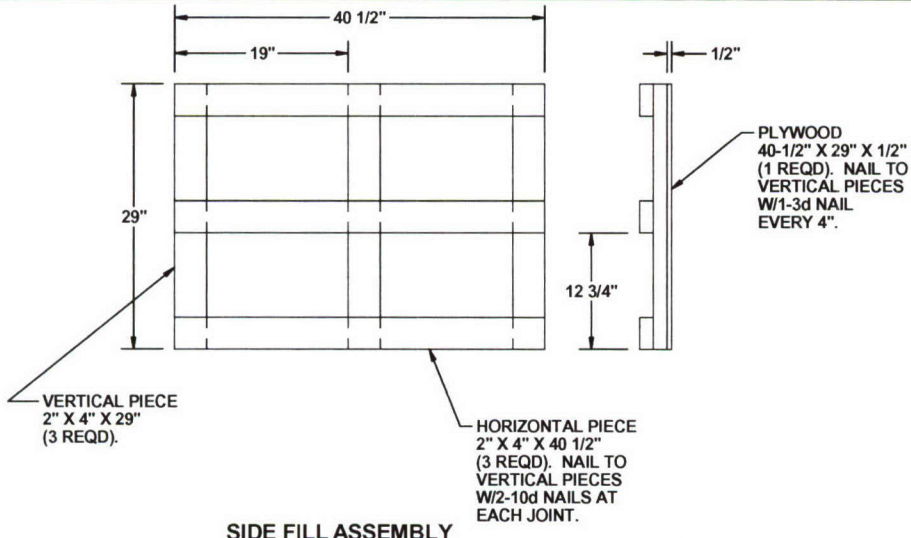



## NAVY CLOSED PANEL JMIC UNIT

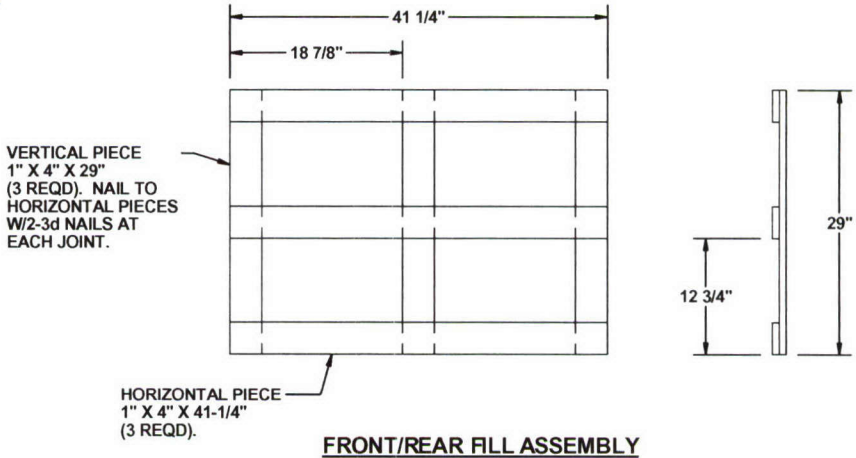
| | |
|---|---|
| 20 M548 BOXES @ 125 LBS | 2,500 LBS |
| DUNNAGE | 146 LBS |
| CLOSED PANEL NAVY JMIC | 325 LBS |
| TOTAL WEIGHT | 2,971 LBS (APPROX) |
| CUBE | 56.4 CU FT (APPROX) |

### BILL OF MATERIAL

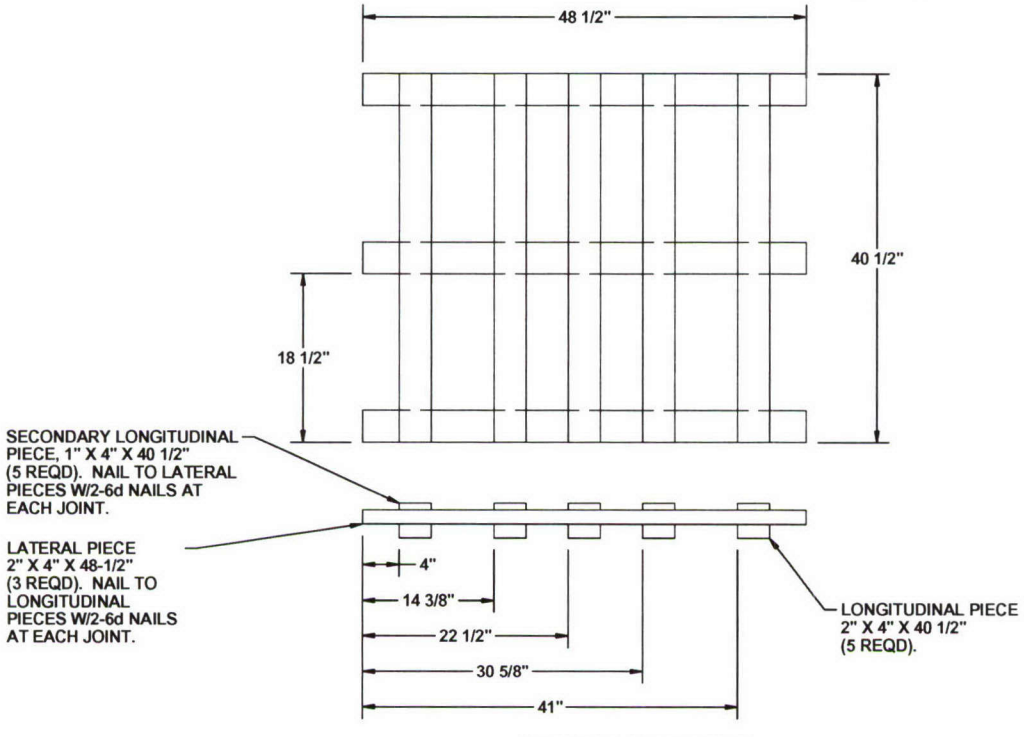
| LUMBER | LINEAR FEET | BOARD FEET |
|---|---|---|
| 1" X 4" | 52 | 18 |
| 2" X 4" | 64 | 43 |
| **NAILS** | **NO. REQD** | **POUNDS** |
| 3d (1-1/4") | 84 | .16 |
| 6d (2") | 60 | .35 |
| 10d (3") | 36 | .54 |
| NAVY PANEL JMIC | 1 REQD | 325 LBS |
| 1/2 PLYWOOD | 17 SQ FT | 23 LBS |



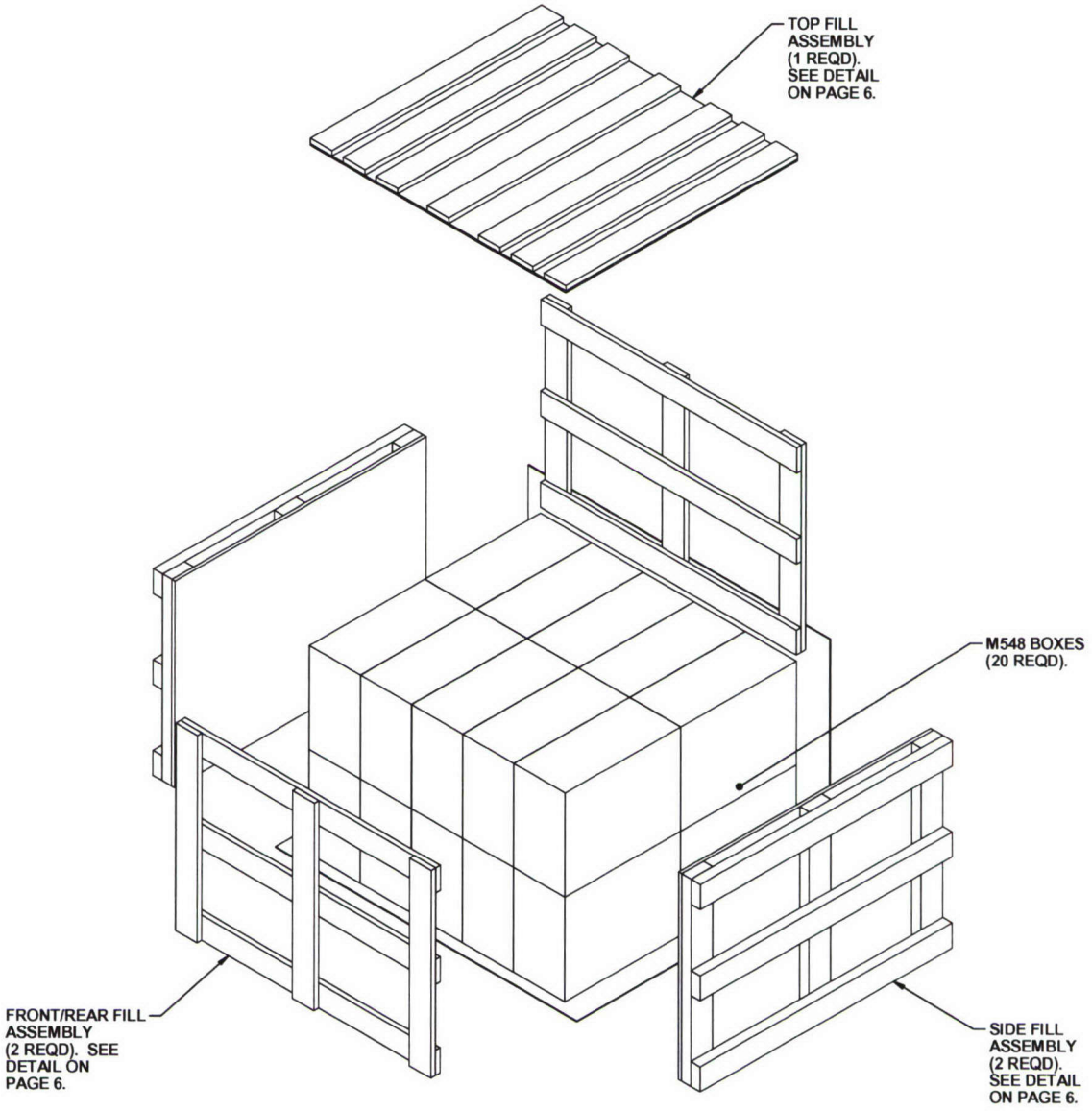

**SIDE FILL ASSEMBLY**
(2 REQD)




**FRONT/REAR FILL ASSEMBLY**
(2 REQD)




**TOP FILL ASSEMBLY**
(1 REQD)




## NAVY OPEN FRAME JMIC UNIT

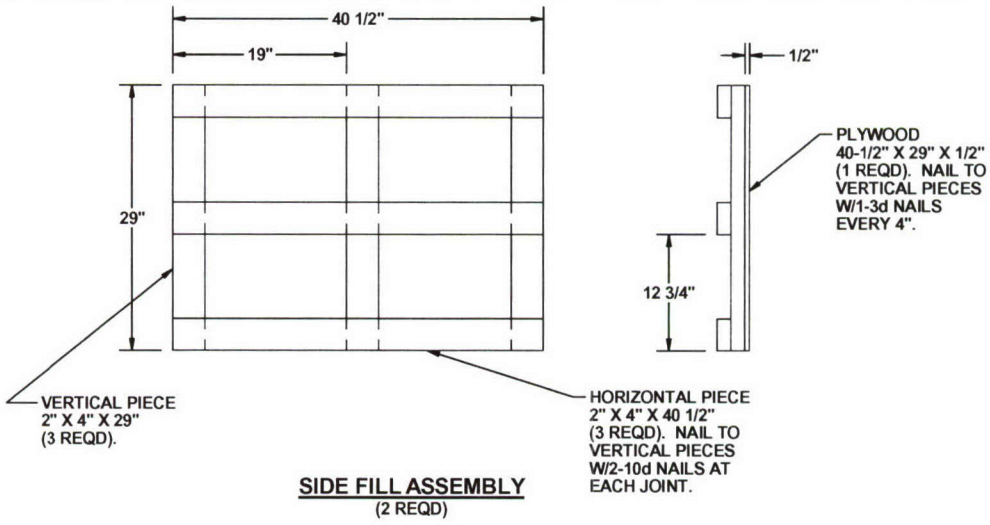
STRAPPING NOT SHOWN, SEE STRAPPING DETAIL 1 & 2 ON PAGE 7 FOR FURTHER INFORMATION.

| | |
|---|---|
| 20 M548 BOXES @ 125 LBS | 2,500 LBS |
| DUNNAGE | 127 LBS |
| OPEN FRAME NAVY JMIC | 285 LBS |
| TOTAL WEIGHT | 2,912 LBS (APPROX) |
| CUBE | 56.4 CU FT (APPROX) |

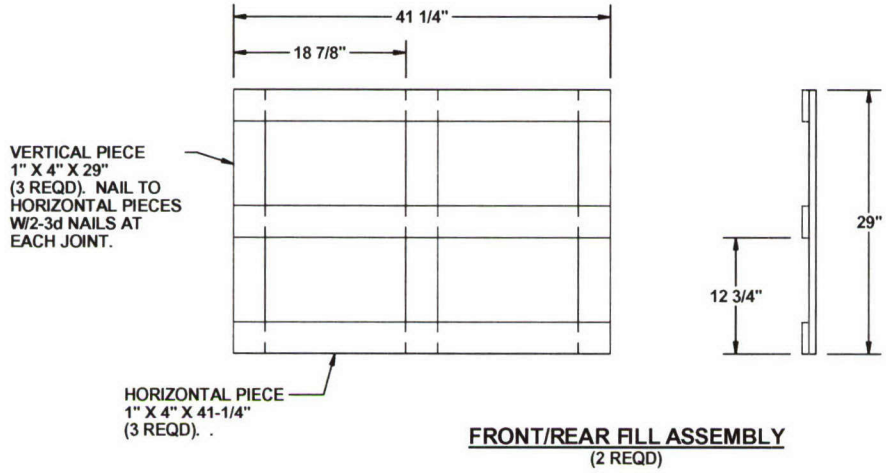
### BILL OF MATERIAL

| LUMBER | LINEAR FEET | BOARD FEET |
|---|---|---|
| 1" X 4" | 57 | 19 |
| 2" X 4" | 35 | 24 |
| **NAILS** | **NO. REQD** | **POUNDS** |
| 3d (1-1/4") | 126 | .23 |
| 10d (3") | 36 | .55 |

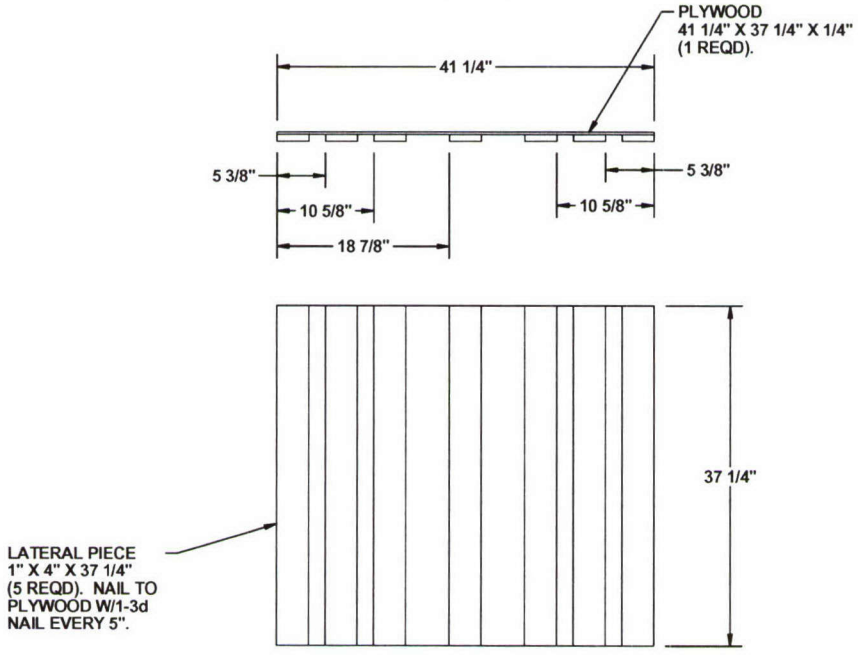
| | |
|---|---|
| NAVY OPEN FRAME JMIC - 1 REQD | 285 LBS |
| PLYWOOD, 1/4 - 11 SQ FT | 8 LBS |
| PLYWOOD, 1/2 - 17 SQ FT | 23 LBS |
| STEEL STRAPPING, 1-1/4" - 56' REQD | 9 LBS |
| SEAL FOR 1-1/4" STRAPPING- 4 REQD | NIL |



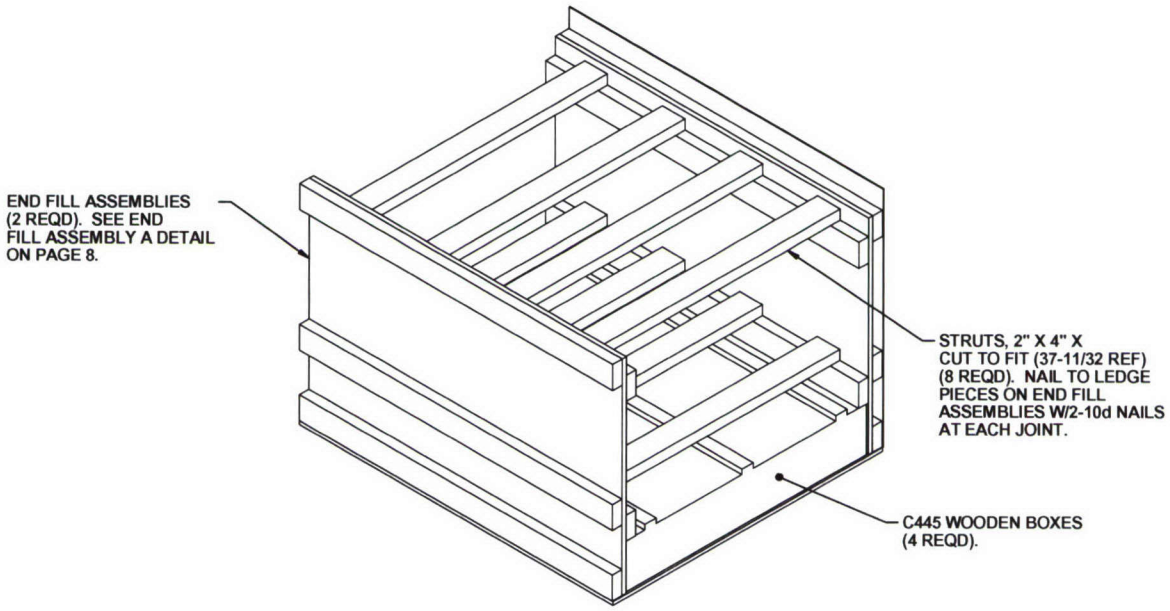

**SIDE FILL ASSEMBLY**
(2 REQD)




**FRONT/REAR FILL ASSEMBLY**
(2 REQD)




**TOP FILL ASSEMBLY**
(1 REQD)



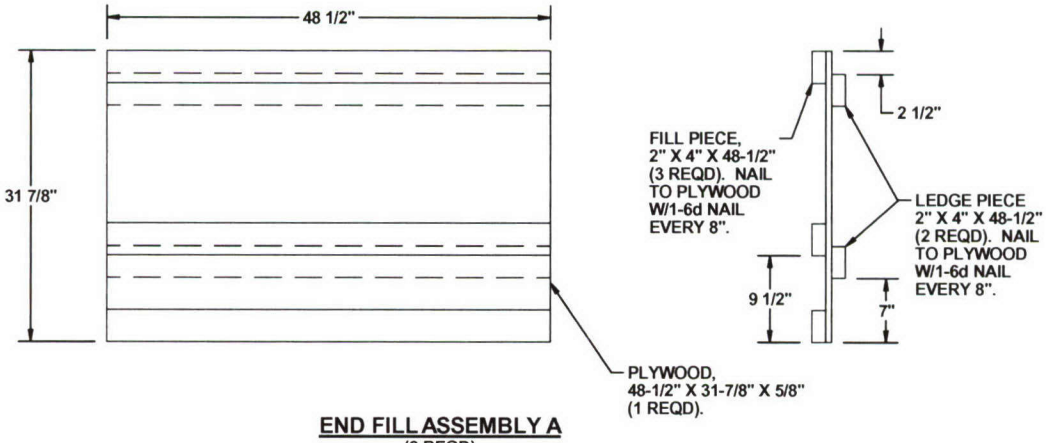

## BAE JMIC UNIT - LIGHT LOAD A

(2 REQD)

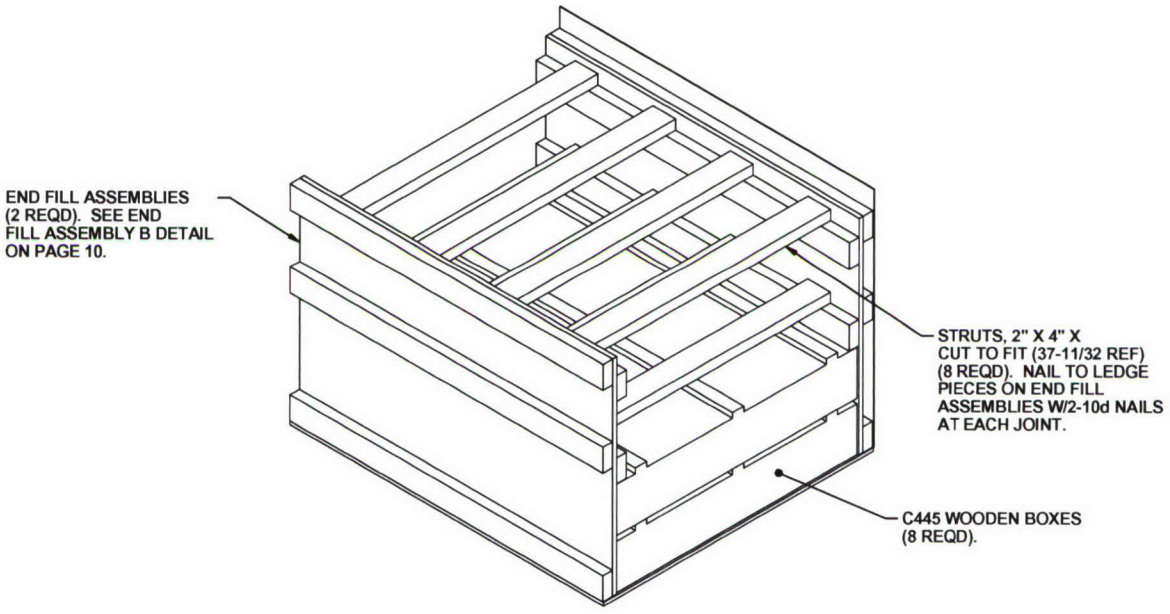
| | |
|---|---|
| 4 C445 BOXES @ 120 LBS | 480 LBS |
| DUNNAGE | 126 LBS |
| BAE JMIC | 310 LBS |
| TOTAL WEIGHT | 916 LBS (APPROX) |
| CUBE | 56.7 CU FT (APPROX) |

**BILL OF MATERIAL**

| LUMBER | LINEAR FEET | BOARD FEET |
|---|---|---|
| 2" X 4" | 66 | 44 |
| **NAILS** | **NO. REQD** | **POUNDS** |
| 6d (2") | 60 | .35 |
| 10d (3") | 32 | .48 |
| BAE JMIC | 1 REQD | 310 LBS |
| 5/8 PLYWOOD | 22 SQ FT | 37 LBS |




**END FILL ASSEMBLY A**
(2 REQD)



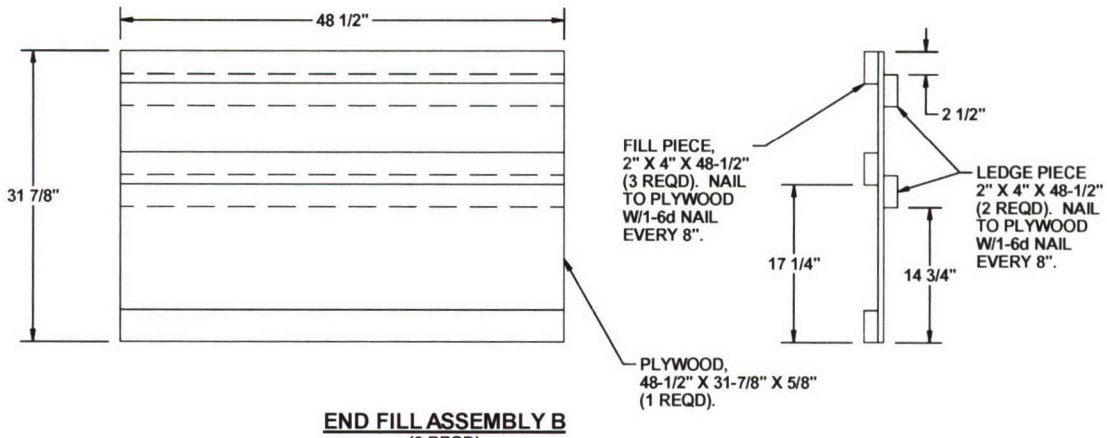

## BAE JMIC UNIT - LIGHT LOAD B

(2 REQD)

| | |
|---|---|
| 8 C445 BOXES @ 120 LBS | 960 LBS |
| DUNNAGE | 126 LBS |
| BAE JMIC | 310 LBS |
| TOTAL WEIGHT | 1,396 LBS (APPROX) |
| CUBE | 56.7 CU FT (APPROX) |

### BILL OF MATERIAL

| LUMBER | LINEAR FEET | BOARD FEET |
|---|---|---|
| 2" X 4" | 66 | 44 |
| **NAILS** | **NO. REQD** | **POUNDS** |
| 6d (2") | 60 | .35 |
| 10d (3") | 32 | .48 |
| BAE JMIC | 1 REQD | 310 LBS |
| 5/8 PLYWOOD | 22 SQ FT | 37 LBS |




**END FILL ASSEMBLY B**
(2 REQD)